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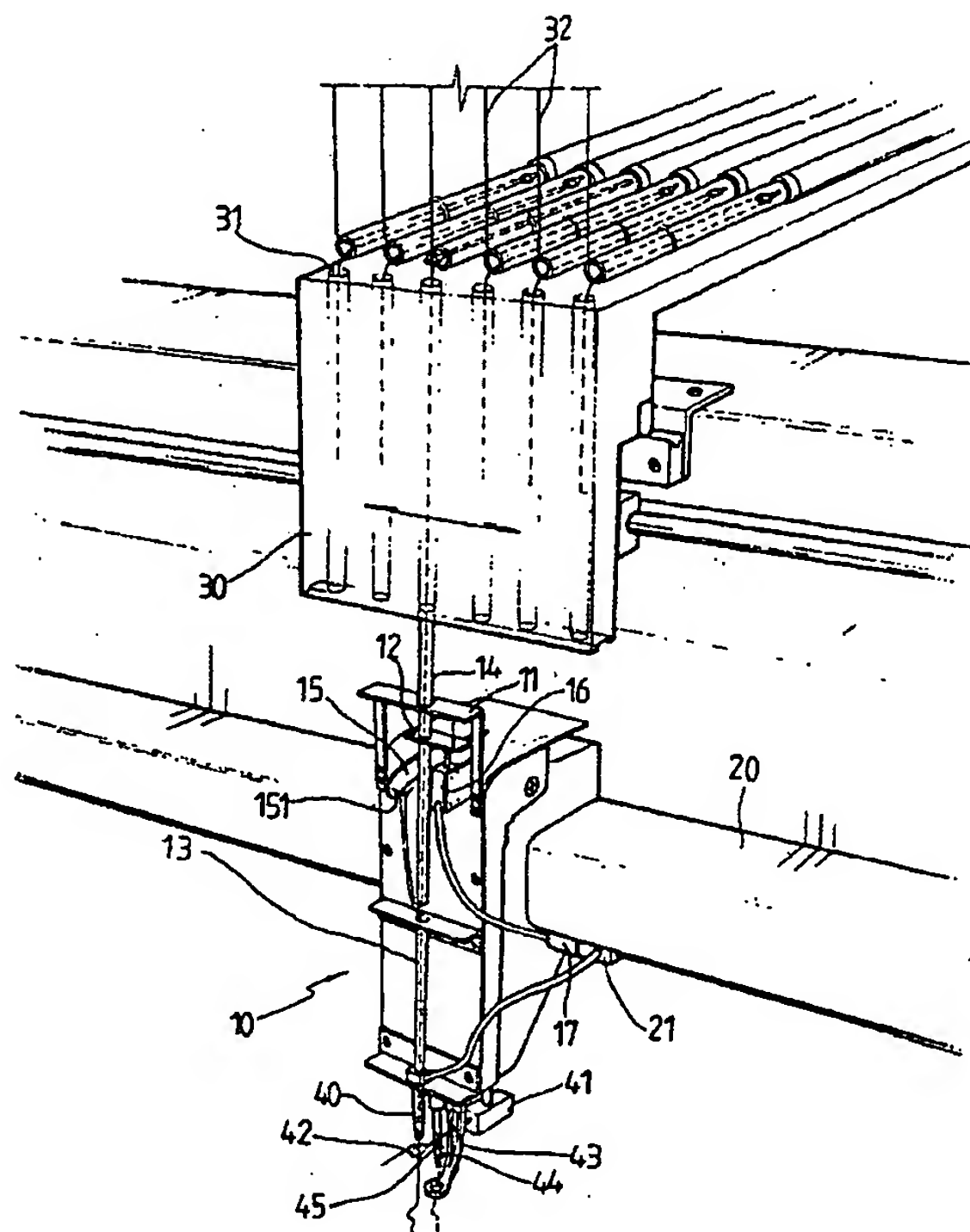
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(54) Title: DEVICE FOR FEEDING UPPER THREADS FOR EMBROIDERING MACHINE



(57) Abstract: In a device for feeding an upper thread (32) for an embroidering machine which is designed to feed a plurality of upper threads using a feed frame over a head (10) having a thread take-up lever mounted on a fixing board, the device includes: a vertical operating tube (14) and a fixed tube (13) provided between the head (10) and the feed frame for feeding the upper threads (32) a three-stage air valve; a cylinder operated in three stage by the action of the three-stage air valve; a conveying plate integrally formed with the overlying vertical operating tube and erected at the end of the three-stage cylinder (15), a thread-end fixing hook (151) made of a flexible spring material and formed at the front end of the thread take-up level (15) the thread-end fixing hook (151) being operative in connection with the cylinder; and a feed nozzle (40) provided as a pneumatic system for injecting a compressed air, wherein when the cylinder (16) is located at the utmost high position, the thread take-up lever (15) is moved to the rear of the vertical operating tube (14) and the feed nozzle (40) injects a compressed air to feed a desired upper thread; and with the vertical operating tube (14) ascending, the upper thread is hooked over the thread-end fixing hook (15) and moved to the front of the vertical operating tube (14), thus feeding the desired upper thread by the action of the head (10) and maintaining a tension of the upper thread to facilitate an embroidering operation.

DEVICE FOR FEEDING UPPER THREADS FOR EMBROIDERING MACHINE

Technical Field

5 The present invention generally relates to an automatic
embroidering machine for making a decorative needlework picture or
pattern mainly on a label fixed on a garment or shoe, or the garment
or shoe itself, and more particularly, a device for feeding upper
10 threads for an automatic embroidering machine which has a simplified
structure with a single netting needle and a single thread take-up
lever on a head of the embroidering machine, thus minimizing a failure
rate, and automatically feeds the upper threads using a pneumatic
system when the thread snaps during an embroidering operation.

15 Background Art

In regard to a widely spread automatic multi-head embroidering
machine, the upper threads fed by the fast action of ascending thread
take-up levers in the head snap so often during an embroidering
operation, in which case the worker has to perform a troublesome
20 manual operation for binding the broken threads to the pinhole, greatly
deteriorating efficiency of production.

Also, the conventional automatic multi-head embroidering
machine needs an assembly process of a large number of parts such
as a plurality of color-specific thread take-up levers for feeding upper
25 threads corresponding to the individual colors, leading to a high failure
rate. Especially, the worker has to correctly cut the head of a broken
thread prior to insertion into the pinhole, which may results in a
deterioration of production efficiency.

Besides the above drawbacks, the conventional automatic
30 embroidering machine has one head provided with various parts such
as a plurality of thread take-up levers and netting needles and the
individual color-specific upper threads bound to each of the
assemblies of thread take-up lever and netting needle. Thus after the
completion of an embroidering operation for one color, the circuitry
35 automatically cuts the previously used upper thread of the color away.

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and prepares the next upper thread of a desired color with a thread take-up lever and the respective parts corresponding to the next color-specific upper thread. However, such a conventional embroidering machine requires the worker to reluctantly cut off the used upper thread and insert a different color of upper threads into the pinhole in a manual way as the desired color of the thread varies. This greatly deteriorates the efficiency of production.

That is, the conventional automatic embroidering machine, which has one head bound to a plurality of upper threads of different colors for making an embroidery picture or pattern on the surface of a piece of cloth or leather, involves some disadvantages in feeding the upper threads as follows: (1) the head must be large in volume and uniform in top and bottom positions for every needles; (2) the color of the thread is changed by the action of the head, which causes abrasion of parts fixed to the head and hence often breakage of the upper threads; (3) an excess of time is taken in feeding the threads; and (4) the worker must be on standby around the embroidering machine all through the running time and easy to have extreme fatigue, thus greatly deteriorating the efficiency of production.

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Disclosure of the Invention

It is therefore an object of the present invention to provide a device for feeding upper threads which has a simplified structure having a single netting needle and a single thread take-up lever provided on the head for every colors, thus reducing the production cost of the machine, and automatically detects a break of the upper thread during an embroidering operation to activate a solenoid by the action of a pneumatic system and thus insert the broken upper thread into a pinhole in an automatic manner, which eliminates a workers reluctant manual operation for binding the broken thread and secures production without interruption of the embroidering operation.

It is another object of the present invention to provide a device for feeding an upper thread of a desired color automatically by the action of a feed frame provided on the head in an automatic embroidering machine, thus doubling the efficiency of production.

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Brief Description of the Drawings

The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and together with the description serve to explain the principles of the invention:

In the drawings:

Fig. 1 is a perspective view showing a preferred embodiment of the present invention;

10 Fig. 2 is a schematic side view showing an operation of the present invention;

Fig. 3 is a schematic side view showing an operation of a thread take-up lever prior to feeding the upper thread in accordance with the present invention;

15 Fig. 4 is a schematic side view showing an operation of the thread take-up lever in feeding the upper thread in accordance with the present invention;

Fig. 5 is a schematic side view showing an operation of the thread take-up lever after feeding the upper thread in accordance with present invention;

20 Fig. 6 is a schematic side view showing the descending position of a vertical operating tube in accordance with the present invention;

Fig. 7 is a schematic side view showing a feed nozzle provided on the top of a thread feeding hole as an additional important part of the present invention; and

25 Fig. 8 is a perspective view showing the structure of auxiliary tube and an auxiliary ring independently being capable of an up-and-down motion by a separate controller, as additional important parts of the present invention.

Best Mode for Carrying Out the Invention

Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. Fig. 1 is a perspective view

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showing a preferred embodiment of the present invention, and Fig. 2 is a schematic side view showing an operation of the present invention.

A detailed description will be avoided herein as to the structures of parts necessary to an automatic embroidering operation, such as compressors, electrical parts and switches, which are well known in the art. Since the functions of the individual parts, i.e., feeding an upper thread after the thread snapped, replacing a used upper threshold with a new one of a desired color, or altering the positions of the individual upper threads of different colors, as well as their timings are well known in the art and implemented with known circuit constructions, a detailed description will be omitted herein as to the known circuit constructions. A separate sensor automatically detects a broken thread to take necessary measures and a multi-head automatic embroidering machine uses herein has a plurality heads 10 which are all the same in structure and function. Expediently, the present invention will be described in regard to a single head.

A device for feeding an upper thread 32 for an automatic embroidering machine according to the present invention includes a vertical operating tube 14 and a fixed tube 13 mounted in a line in the running direction of an upper thread 32, which is fed through a thread feeding hole 31 formed on a feed frame 30. The vertical operating tube 14 is mounted so as to make an up-and-down motion on an erection base 11 fixed to a head 10. The vertical operating tube 14 is integrally formed with an underlying conveying plate 12 erected at the end of a three-stage cylinder 16, which is driven by a three-stage air valve 17. The vertical operating tube 14 is operated under the control of a separate controller (not shown). The device also includes a thread-end fixing hook 151 made of a flexible spring material and formed at the front end of the thread take-up lever 15, the thread-end fixing hook 151 being operated in connection with the cylinder 16.

When the cylinder 16 located at the utmost high position, the thread take-up lever 15 is moved to the rear of the vertical operating tube 14 and then the upper thread 32 is supplied. With the vertical

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operating tube 14 moved up again, the upper thread 32 is hooked over the thread-end fixing hook 151 and moved to the front of the vertical operating tube 14. Thus the upper thread 32 can be supplied upon operation of the head 10 while maintaining the tension of the upper thread 32.

The front end of the thread take-up lever 15, whose working range is dependent upon the operation of the cylinder 16, forms the thread-end fixing hook 151 made of a very flexible spring material. The bottom end of the fixing tube 13 is bound to a feed nozzle 40 so that the upper thread 32 is fed to a binding pin 42 in a pneumatic manner. Also, the vertical operating tube 14 is mounted so as to make an up-and-down motion on the erection base 11 fixed to the head 10. The vertical operating tube 14 is integrally formed with the underlying conveying plate 12, which is erected at the end of the cylinder 16 operating in a three-stage manner by the three-stage air valve 17. The separate controller (not shown) controls the vertical operating tube 14 to move down close to the underlying fixed tube 13, form a working space, or moving the thread take-up lever 15 to the rear of the cylinder body, thus feeding the overlying upper thread 32.

Figs. 3 to 6 are schematic side views illustrating an operating situation of the present invention as constructed above. A description will now be given to the operation of the present invention with reference to Figs. 3 to 6.

When the upper thread 32 is replaced with another one during the embroidering operation in order to change the color of the thread, or when the upper thread snaps due to a load on the upper thread 32, friction or other factors, the sensor detects such an event, i.e., replacement or break of the upper thread 32 and the embroidering machine is suspended. In such a case, a solenoid 41 provided at the rear of a lower needle 44 drives the binding pin 42 to pass through a pinhole 45 and stand at the lower front end of the feed nozzle 40. As the vertical operating tube 14 on the head 10 gets apart from the fixed tube 13, the thread take-up lever 15 moves down and the thread-end fixing hook 151 provided at the front end of the thread

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take-up lever 15 passes through a space a (shown in Fig. 6) between the vertical operating tube 14 and the fixed tube 13.

With the thread take-up lever 15 located at the rear of the vertical operating tube 14, the cylinder 16 descends under the action of the three-stage air valve 17 provided on the bottom surface of a fixing board 20 and the vertical operating tube 14 becomes close to the fixed tube 13 to form a connecting pipe line.

Preferably, the contact portions between the vertical operating tube 14 and the fixed tube 13 are provided with caps made of a rubber material so as to maintain the closer contact.

With this, when a high pressure air is injected instantaneously from a separate air valve 21 provided on the bottom surface of the fixing board 20, the broken head of the upper thread 32 is exposed to the feed nozzle 40 via the interior pipe line of the fixed tube 13. The continuously exposed upper thread 32 is fed into the binding pin 42 of the solenoid 41 associated through the pinhole 44 and the solenoid 41 retrogrades instantaneously, as a result of which the head of the upper thread 32 located at the front end of the feed nozzle 41 is hooked in the pinhole 45.

With the head of the upper thread 32 in the pinhole 45, the vertical operating tube 14 on the head 10 ascends under the action of the cylinder 16 controlled by the three-stage air valve 17 and returns to the position a separated from the fixed tube 13. Thus the upper thread 32 becomes open to the gap between the vertical operating tube 14 and the fixed tube 13.

Meanwhile, as the thread take-up lever 15 standing in the rear of the vertical operating tube 14 moves up, the exposed upper thread 32 gets out of the thread-end fixing hook 151 provided at the front end of the thread take-up lever 15. With the thread take-up lever 15 ascending to the utmost high position, the vertical operating tube 14 descends to an optimal working position b for the thread take-up lever 15 in connection with the descending needle 44 for performing an embroidering operation, under the action of the cylinder 16 controlled by the three-stage air valve 17.

This descending motion of the vertical operating tube 14 also

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prevents the thread take-up lever 15 passing through a space between the vertical operating tube 14 and the fixed tube 13 to be in the rear of the two pipe lines.

The present invention is applied to the case of replacing the upper thread 32 with another of a desired color or feeding the upper thread 32 after the thread is broken. First, only the upper thread 32 of a color to change descends through the thread feeding hole 31 of the feed frame 30 with the other threads remaining in the thread feeding hole 31, and only the upper thread 32 of a desired color is exposed to the front end of the feed nozzle 40 through the interior pipe line of the fixed tube 13 connected to the vertical operating tube 14 and hooked in the pinhole 45 of the needle. Applying the power activates a presser foot 43 by the action of the circuitry to set to embroider a pattern on the garment or shoe.

Fig. 7 is a schematic side view illustrating a feed nozzle 401 as an additional part provided on the thread feeding hole 31, in which an air insert hole 311 having an adequate down-hill grade from the upper surface of the feed frame 30 is formed to pierce the thread feeding hole 31 with a view to injecting a compressed air from the feed nozzle 401 to the thread feeding hole 31.

As a second cardinal point of the present invention, the feed nozzle 401 operates at the same time with the feed nozzle 40 underlying the fixed tube 13 of the head 10 upon detection of thread replacement or break, to inject a compressed air to the thread feeding hole 31 and transfer the upper thread 32 down, rapidly holding the upper thread 32 to the needle 44.

Fig. 8 illustrates an alternative structure of the vertical operating tube 14 derived to minimize any possible mechanical interference by the vertical operation tube 14 during an operation of the thread take-up lever 15. This novel structure of the vertical operating tube 15 is implemented with an auxiliary ring 142 and an auxiliary tube 141, which are capable of moving up and down under the action of air valves 212 and 211 controlled by separate cylinders 161 and 162. That is, the auxiliary tube 141 and the auxiliary ring 142 independently making an up-and-down motion by the action of the separate air

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valves 212 and 211 may substitute for the afore-mentioned principal parts of the present invention, i.e., the three-stage conveying plate 12 and the vertical operating tube 14.

The operations of the auxiliary tube 141 and the auxiliary ring 142, which are not shown, will be described as follows.

In a case of replacing the upper thread 32 or breaking the thread, the auxiliary tube 141 with the auxiliary ring 142 inserted therein descends by the action of the cylinder 162 and becomes associated with the fixed tube 13, forming an air passage. Thus the thread take-up lever 15 is located at the rear of the auxiliary tube 141. As the upper thread 32 is hooked in the pinhole 45, the auxiliary tube 141 ascends under the action of the cylinders 161 and 162 controlled by the air valves 211 and 212 so that the upper thread 32 is exposed to a gap formed by the auxiliary tube 151 with the auxiliary ring 142 inserted therein.

Meanwhile, as the thread take-up lever 15 standing in the rear of the auxiliary tube 141 moves up, the exposed upper thread 32 gets out of the thread-end fixing hook 151 provided at the front end of the thread take-up lever 15. With the thread take-up lever 15 ascending to the utmost high position, the auxiliary ring 152 being separated from the auxiliary tube 141 descends to an optimal working position for the thread take-up lever 15 in connection with the descending needle 44 for performing an embroidering operation, under the action of the cylinder 161 controlled by the air valve 212.

That is, the present invention uses the auxiliary tube 141 and the auxiliary ring 142 independently moving up and down by the action of the separate air valves 212 and 211, as a substitute for the three-stage conveying plate 12 and the vertical operating tube 14, eliminating possible interference with an operation of the thread take-up lever 15 and thereby facilitating the mechanical operation of the embroidering machine.

Industrial Applicability

The conventional multi-head embroidering machine has a complex mechanical structure in need of a large number of

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color-specific netting needles and thread take-up levers mounted on the head, causing the difficulty in the manufacture of the machine, and requires multiple netting needles and thread take-up levers operative in changing the color of the thread, consuming an excess of parts with deteriorated precision and thus causing a break of the thread. Contrarily, the present invention has a simplified structure with one netting needle and one thread take-up lever and uses a pneumatic system to reduce unnecessary mechanical operations and eliminate allowable errors caused by using a large number of netting needles, thus reducing possible failure in breaking the thread. The invention also simplifies the manufacture and assembly process, reduces production costs of the machine and induces more efficient production by the worker.

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Claims:

1. A device for feeding an upper thread for an embroidering machine, which is designed to feed a plurality of upper threads using a feed frame over a head having a thread take-up lever
5 mounted on a fixing board, the device comprising:

a vertical operating tube and a fixed tube provided between the head and the feed frame for feeding the upper threads, the vertical operating tube and the fixed tube being arranged in a line in the running direction of the upper threads fed through thread feeding
10 holes formed on the feed frame, the vertical operating tube being mounted to make an up-and-down motion on an erection base fixed to the head, the vertical operating tube being controlled by a separate controller;

a three-stage air valve;

15 a cylinder operated in three stages by the action of the three-stage air valve;

a conveying plate integrally formed with the overlying vertical operating tube and erected at the end of the three-stage cylinder;

a thread-end fixing hook made of a flexible spring material and
20 formed at the front end of the thread take-up lever, the thread-end fixing hook being operative in connection with the cylinder; and

a feed nozzle provided as a pneumatic system for injecting a compressed air,

wherein when the cylinder is located at the utmost high
25 position, the thread take-up lever is moved to the rear of the vertical operating tube and the feed nozzle injects a compressed air to feed a desired upper thread; and with the vertical operating tube ascending, the upper thread is hooked over the thread-end fixing hook and moved to the front of the vertical operating tube, thus feeding the
30 desired upper thread by the action of the head and maintaining a tension of the upper thread to facilitate an embroidering operation.

2. The device as claimed in claim 1, further comprising:

an auxiliary tube and an auxiliary ring separately constructed as
35 a substitute for the conveying plate and the vertical operating tube

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and independently capable of moving up and down by the action of separate air valves; and

a cylinder for controlling the air valves,

wherein with the cylinder at the utmost high position, the thread
5 take-up lever stands in the rear of the auxiliary tube with the auxiliary
ring inserted therein; and

when the auxiliary tube ascends again after feeding the upper
thread, the upper thread is hooked over the thread-end fixing hook
and moved to the front of the auxiliary tube, thus feeding the upper
10 thread by the action of the head and maintaining a tension of the
upper thread to facilitate an embroidering operation.

3. The device as claimed in claim 1, further comprising a
second pneumatic system operative with the feed nozzle provided on
15 the bottom surface of the fixed tube of the head and provided with
an air insert hole having an adequate down-hill grade from the top
portion of the feed frame and piercing the thread feeding holes, for
injecting a compressed air from the feed nozzle to the thread feeding
holes.

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Fig. 1

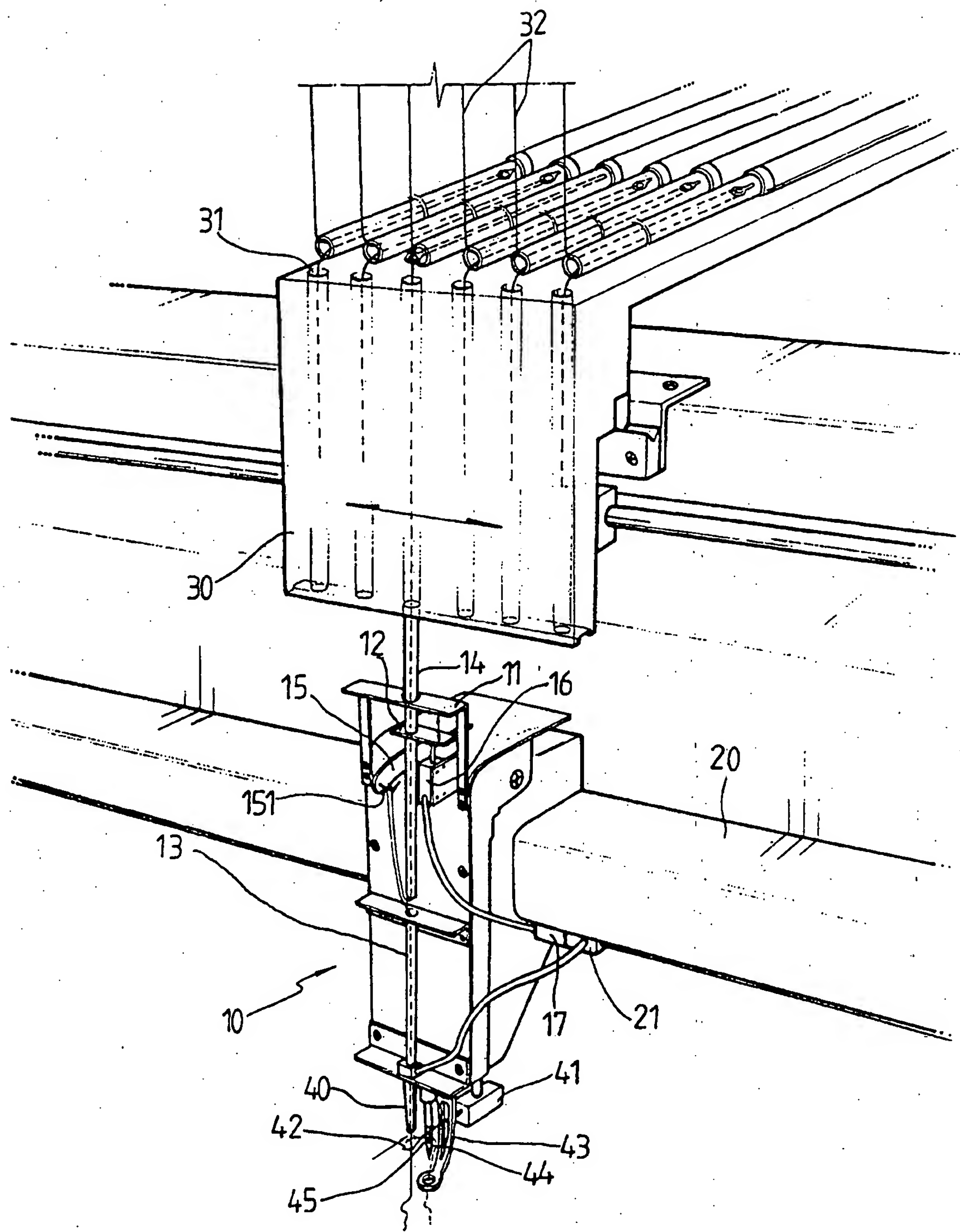


Fig. 2

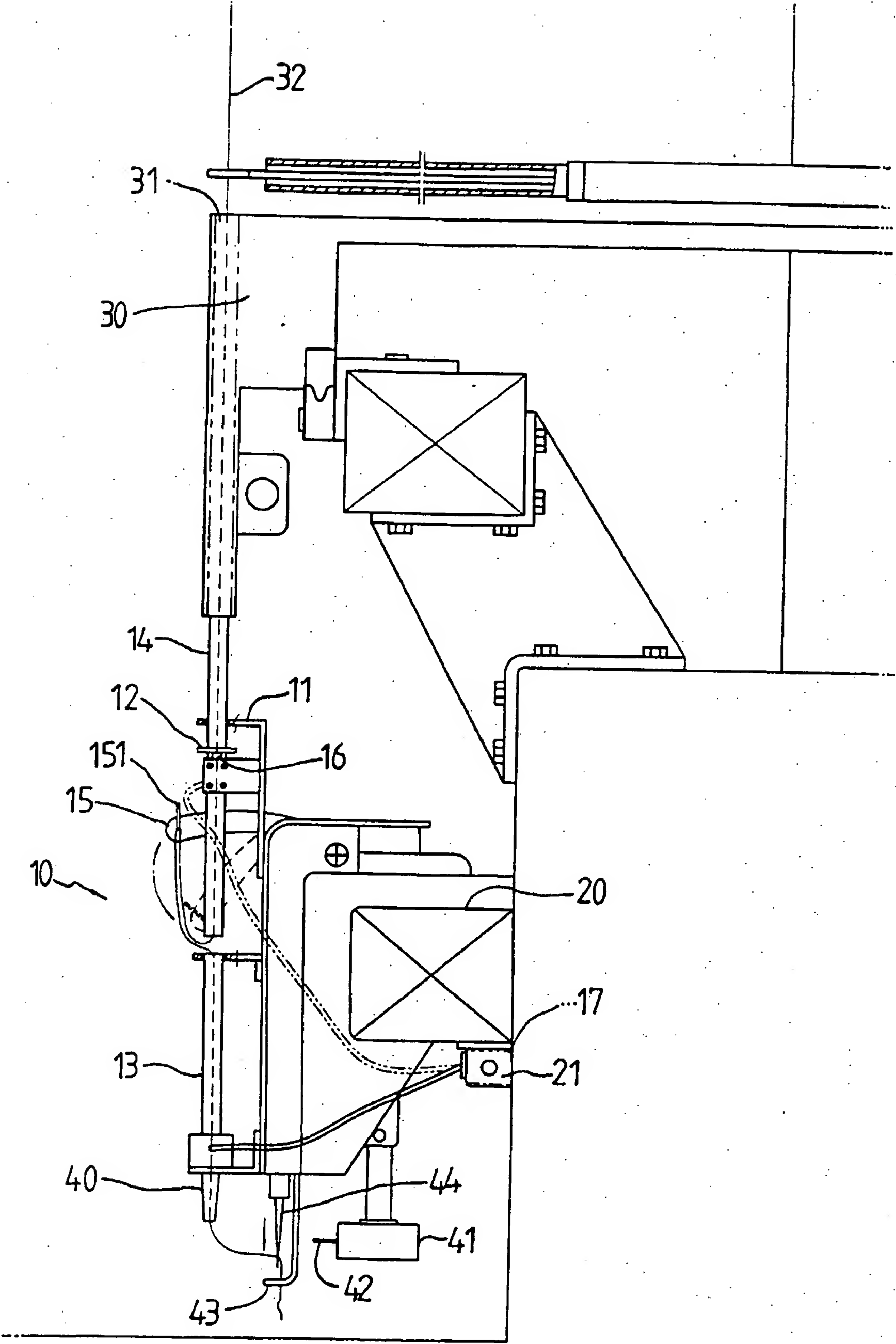


Fig. 3

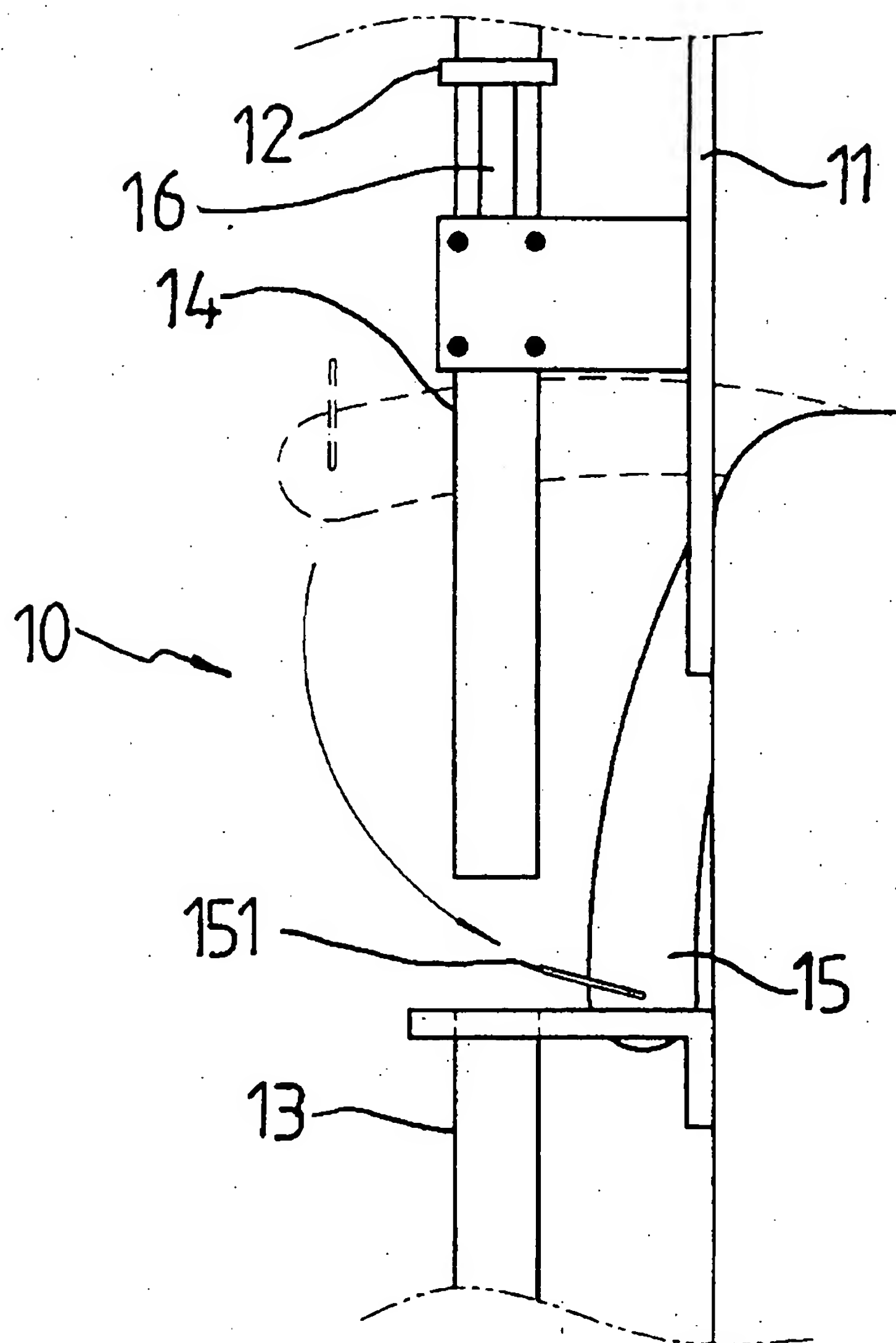


Fig. 4

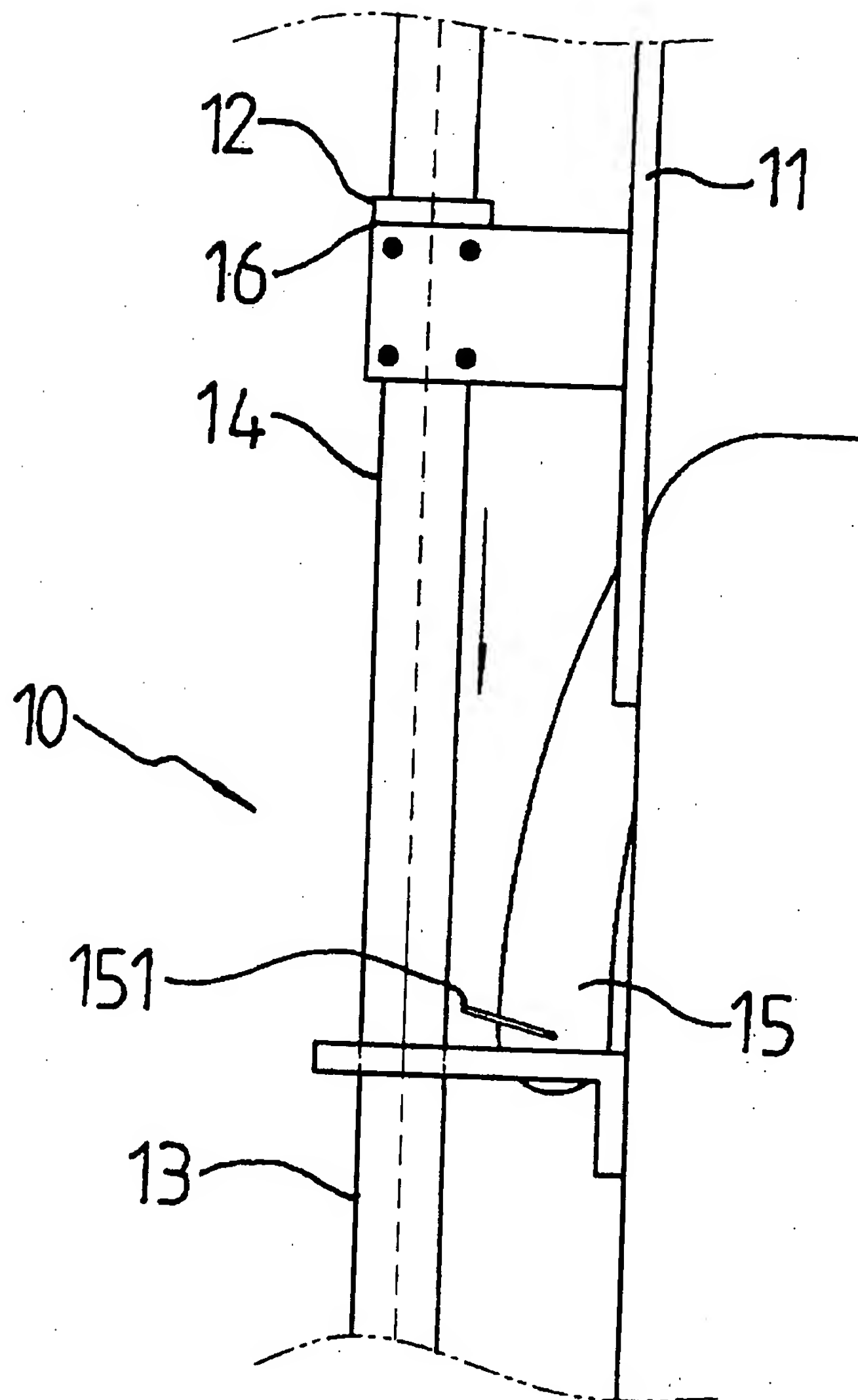


Fig. 5

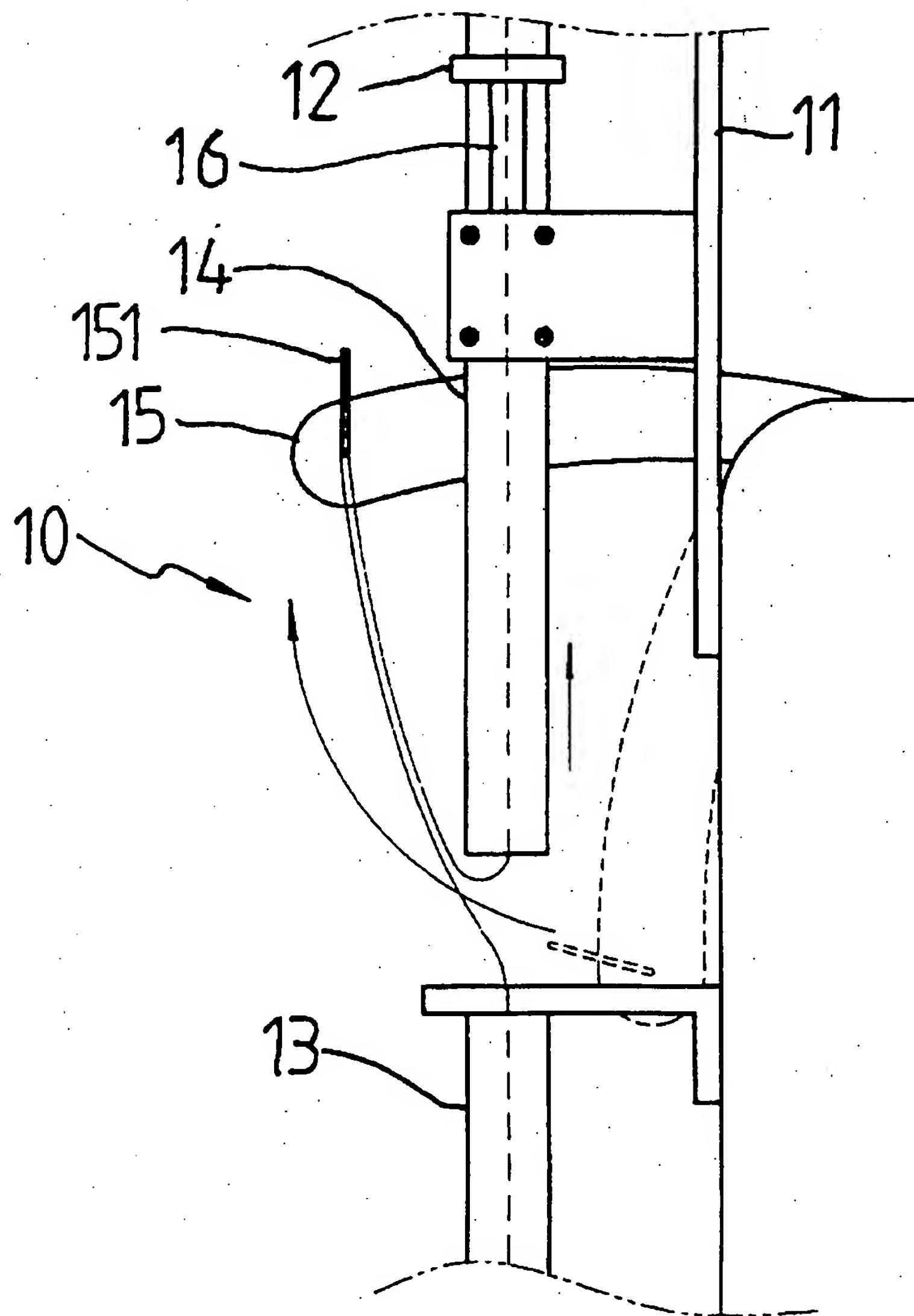
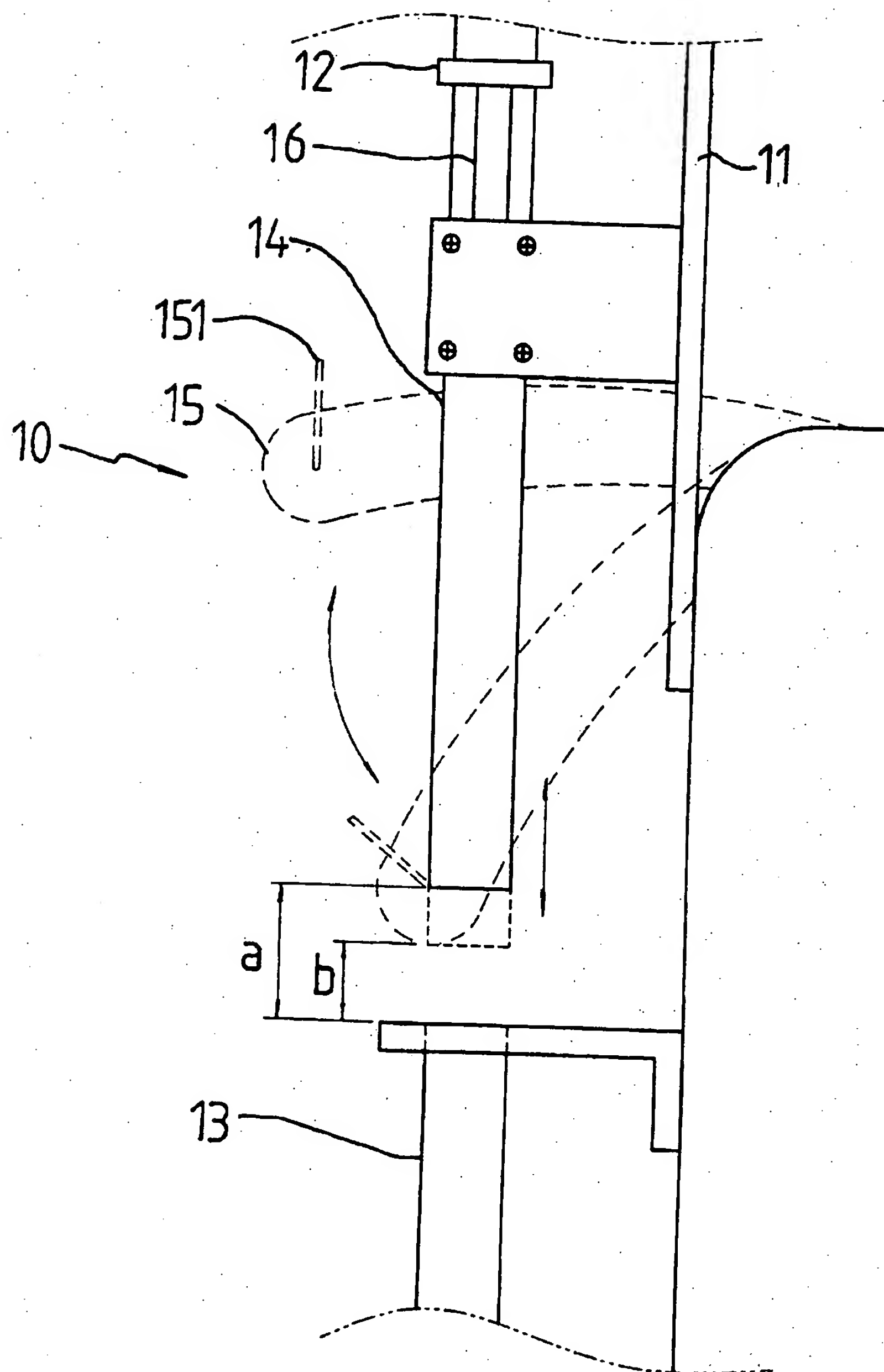


Fig. 6



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR 00/00598

CLASSIFICATION OF SUBJECT MATTER

IPC⁷: D05C 11/16

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC⁷: D05C 11/00, 11/16, 13/02; D05B 49/00, 53/00, 87/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPIL, ESPACENET

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	EP 600297 A (KK. BARUDAN) 8 June 1994 (08.06.94) fig. 1-3,5; claims 1-6.	1,2
A	US 4023512 A (T. MIYAMOTO) 17 May 1977 (17.05.77) fig. 1-3; claims 1,2.	1

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/KR 00/00598

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